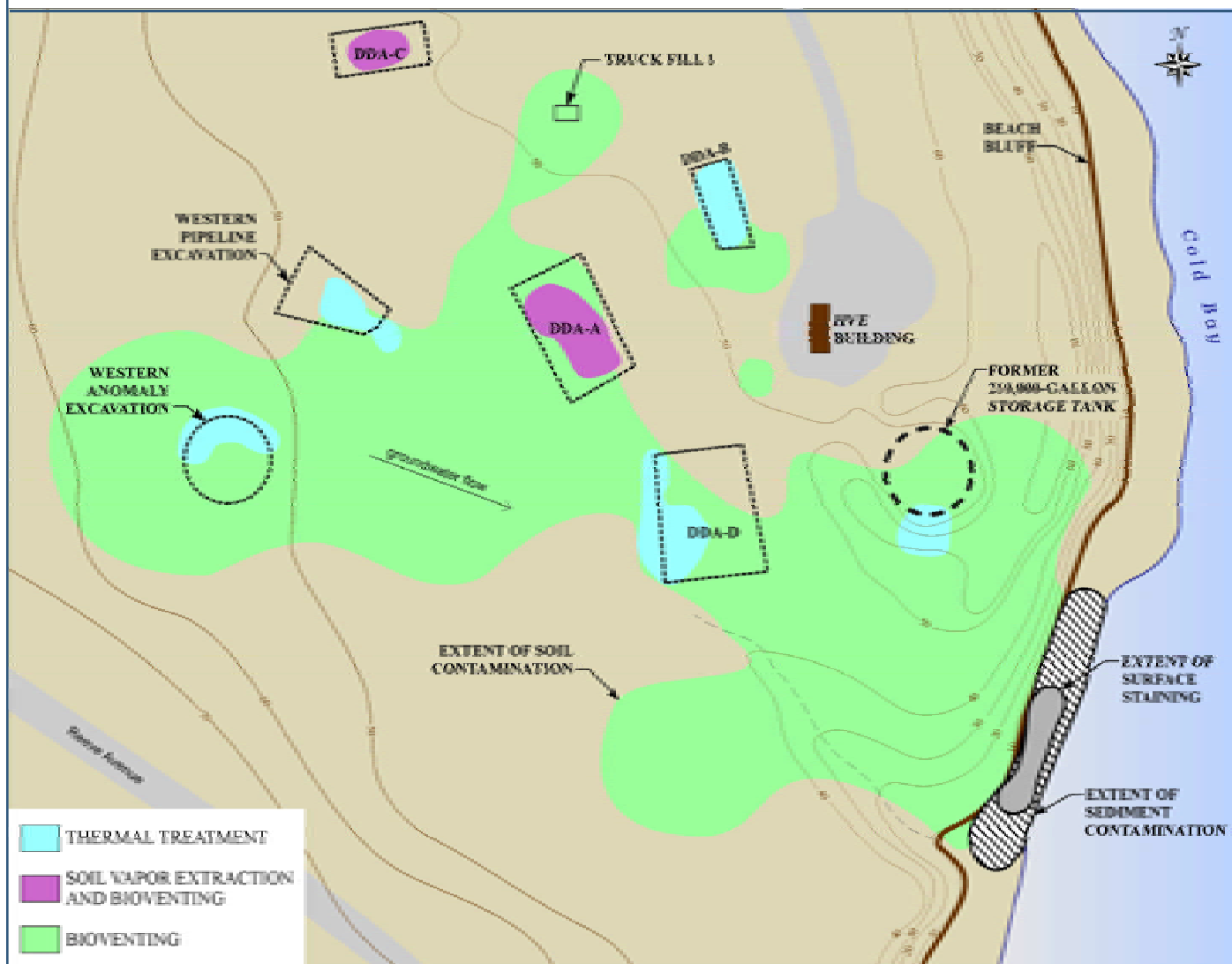


### Extent of Contamination

Contamination at the Drum Disposal Area has mixed with contamination from the neighboring Beach Seep Area. For the purposes of evaluating cleanup options for these two sites, alternatives described in this section focus on the estimated 48,000 cubic yards of contaminated soil present; the next section focuses on addressing free product contamination and soil contamination at the water table. As the water table moves up and down, the free product contamination spreads into the surrounding soils—also known as the smear zone. This smear zone makes up the soil contamination at the water table. The results of the feasibility study indicate that if the free product and the contamination in the soil and smear zone are addressed, natural processes will rapidly restore the quality of groundwater beneath the site and sediment along the beach.

**FIGURE 4: APPROXIMATE EXTENT OF SOIL CONTAMINATION AND PROPOSED CLEANUP UNDER ALTERNATIVE 8**



**Bioventing:** treatment technology that injects air into subsurface soil to increase the activity of indigenous bacteria and rapidly degrade contaminants to nonhazardous compounds.

**Soil Vapor Extraction:** a treatment technology that pumps contaminated air from the subsurface to remove volatile contaminants from soils.

**Thermal Treatment:** A treatment technology that heats contaminated soil to volatilize contaminants. The contaminant vapor is subsequently burned.

### Alternatives Considered for the Drum Disposal Area and Beach Seep Area Soils

- Alternative 1 (DDA 1): No action
- Alternative 7 (DDA 7): Bioventing and soil vapor extraction. Under this alternative, soil vapor extraction would be used to remediate soils containing highly volatile analytes, such as gasoline-range organics, BTEX, and 1,2-dibromoethane. Because bacteria will degrade diesel-range organics when oxygen is present, bioventing would be used in combination with soil vapor extraction to address soil contaminated with diesel fuel. Prior to implementation, a pilot test would be conducted to verify the effectiveness of bioventing and soil vapor extraction for this site and to determine well spacing.
- Alternative 8 (DDA 8): Thermal treatment, bioventing, and soil vapor extraction. This alternative would use three separate technologies to address contamination beneath the Drum Disposal Area. As with Alternative 7, a pilot test would be conducted prior to implementing this alternative to verify the effectiveness of bioventing and soil vapor extraction for this site and to determine well spacing.

**TABLE 6: COMPARISON OF ALTERNATIVES FOR DRUM DISPOSAL AREA (DDA) AND BEACH SEEP AREA SOILS**

Evaluation Criteria	DDA 1	DDA 7	DDA 8
Overall Protection of Human Health and the Environment	○	●	●
Compliance with applicable or relevant and appropriate requirements	○	●	●
Long-Term Effectiveness and Permanence	○	◐	●
Reduction in Toxicity, Mobility, and Volume Through Treatment	○	●	●
Short-Term Effectiveness	◐	◐	◐
Implementability	◐	◐	◐
Cost (in millions)	\$0	\$4.3	\$4.4
● = meets or exceeds criteria    ◐ = partially meets criteria    ○ = does not meet criteria			

### Preferred Alternative for Drum Disposal Area and Beach Seep Area Soils

Alternative 8 is the preferred alternative for this site. The no-action alternative would not protect human health and the environment and was eliminated. Both DDA Alternatives 7 and 8 were found to be viable alternatives. Both alternatives include focused soil vapor extraction systems to remediate volatile contaminants and selectively placed bioventing to degrade less volatile fuel contaminants. The primary difference between Alternatives 7 and 8 is that Alternative 8 involves excavating and thermally treating approximately 8,825 cubic yards of soil contaminated with high diesel fuel concentra-

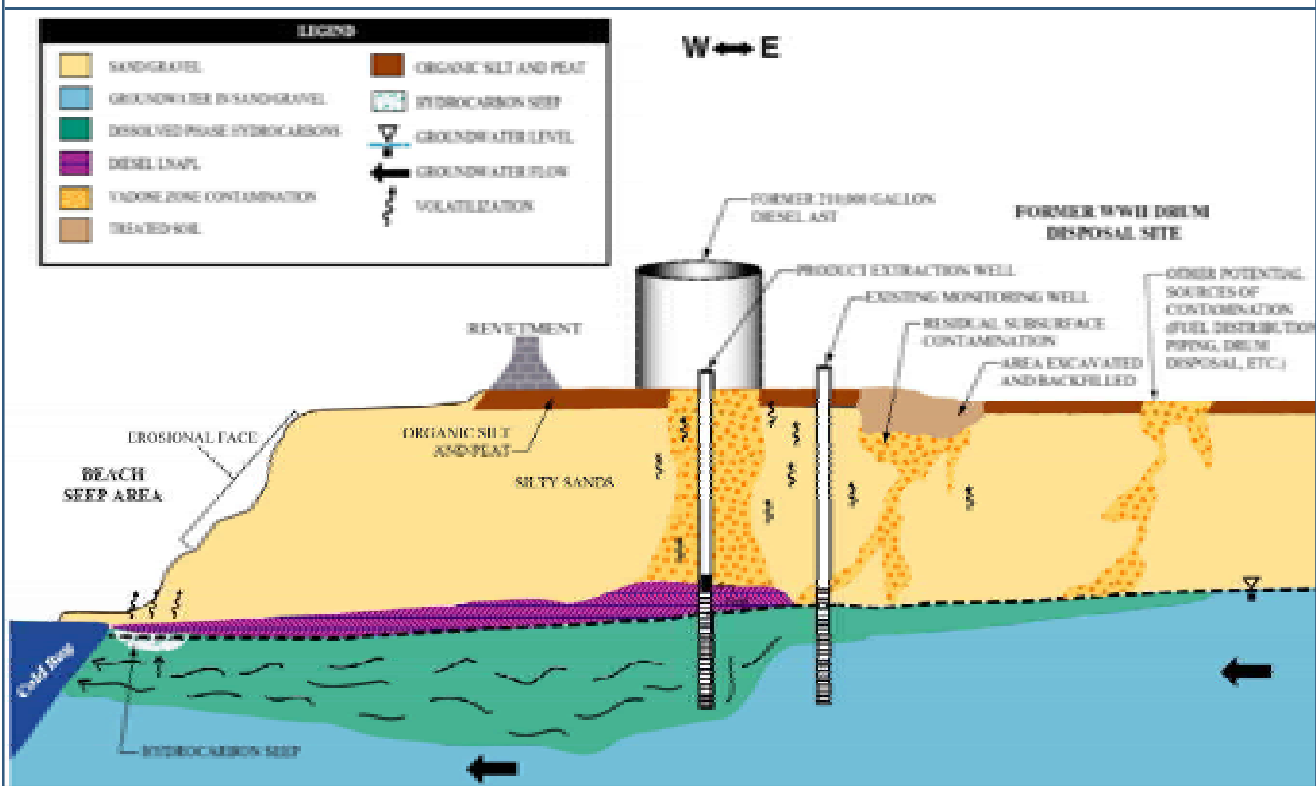
tions (greater than approximately 10,500 mg/kg), while Alternative 7 would treat this soil using bioventing. For soils with diesel fuel concentrations greater than approximately 10,500 mg/kg, bioventing may not be capable of achieving site cleanup standards. Thermal treatment would take place onsite using a portable treatment unit. Although Alternative 7 would be easier to implement, would involve less disruption to the site, and would cost slightly less, Alternative 8 is preferred over Alternative 7 as Alternative 8 is a more aggressive treatment and would more rapidly remove much of the contaminant mass. It is estimated that 15 years of bioventing and three years of soil vapor extraction would be required under Alternative 7, versus six years of bioventing and one year of soil vapor extraction under Alternative 8. Alternative 8 would achieve remedial action objectives more expediently and involve less uncertainty regarding potential effectiveness.

## DRUM DISPOSAL AREA AND BEACH SEEP AREA SEDIMENTS, FREE PRODUCT, AND GROUNDWATER

Contamination addressed in this section includes free product and soil contamination at the surface of the water table (the smear zone), groundwater contamination, and contamination in marine sediments. This contamination is associated with historical fuel spills and releases from the removed 210,000-gallon diesel storage tank and upgradient releases from the Drum Disposal Area.

**Upgradient:** in the direction from which groundwater is flowing.

**FIGURE 5: CONCEPTUAL CROSS-SECTION OF DRUM DISPOSAL AND BEACH SEEP**

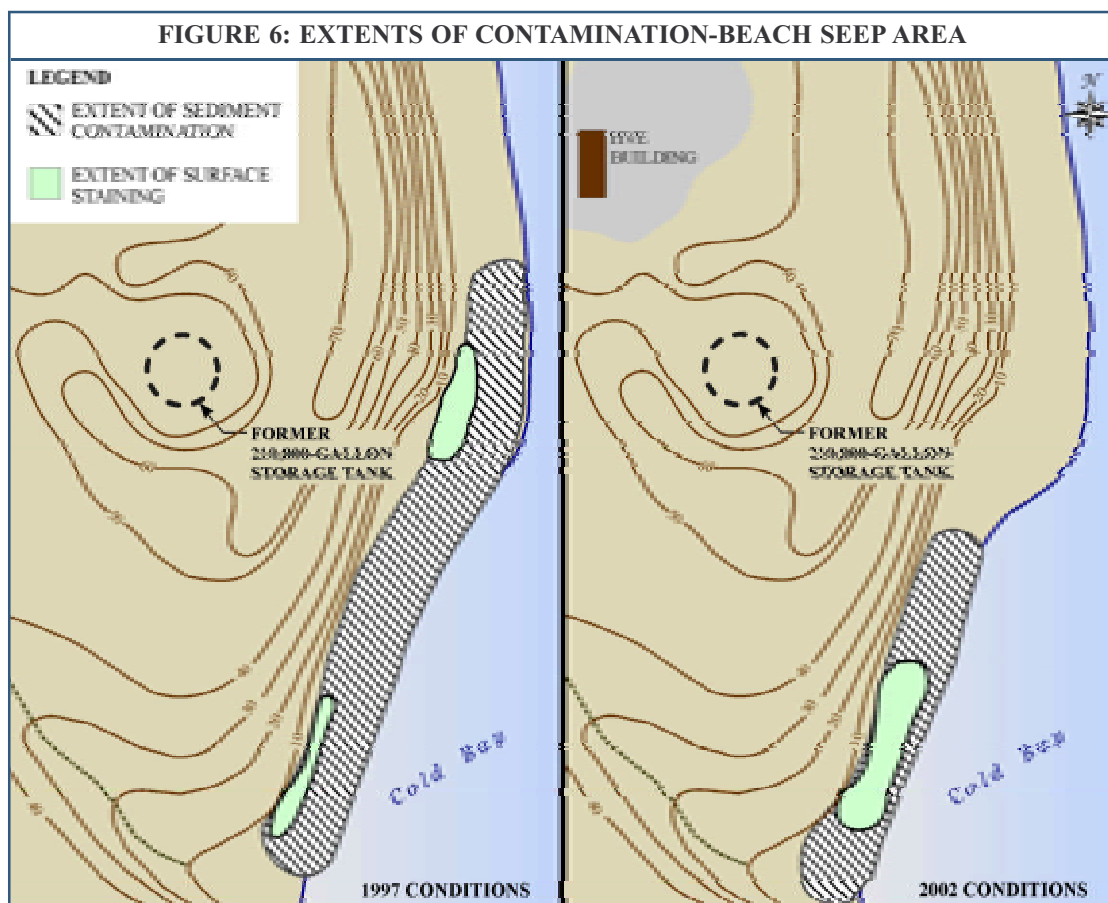


### Previous Environmental Investigations and Cleanup Actions

To date, 15 monitoring wells have been installed to monitor free product thickness and groundwater contamination at the site. Groundwater monitoring has been conducted twice a year since 2001. Samples of sediment from along the beach have been collected periodically, with the most recent samples (seven) collected during the 2002 Remedial Investigation. Site investigations determined that diesel fuel from the previously removed 210,000-gallon tank and possibly from the Drum Disposal Area continues to discharge to Cold Bay at the Beach Seep Area. All known sources of contamination have been removed, but petroleum bound in the soil and floating on the groundwater will continue to migrate to the beach.

Since installation of the high vacuum extraction (HVE) system in 1998, groundwater cleanup efforts have focused on removal of diesel-free product to minimize the discharge of fuel to the beach. As can be seen in Figure 3, the zone of free product is centered beneath the former 210,000-gallon storage tank. As can be seen in Figure 6, the existing HVE system has helped to minimize discharge of free product directly downgradient from the tank, but free product continues to discharge southeast of the tank. As of the end of March 2004, the system had removed approximately 47,000 pounds (6,200 gallons) of diesel fuel contamination.

**High vacuum extraction:** a treatment technology that extracts contaminated soil vapors and groundwater, creating a zone of groundwater depression and allowing recovery of free product.



A pilot study in 2002 concentrated on the area of visible soil staining and diesel product accumulation along the shoreline below the Drum Disposal Area. The study was performed to evaluate options for remediation of the shoreline area and to recommend treatment options. One of the lessons learned from the pilot test is that extraction of contamination along the beach is not feasible.

### **Extent of Contamination**

A geophysical survey in 2002 at the Drum Disposal Area and Beach Seep Area revealed no remaining sources. Test pitting, in conjunction with sediment screening and sampling, on the beach showed the active, visible, petroleum hydrocarbon seep is currently approximately 100 feet long. The survey showed that sediment contamination extended about 250 feet. Inland test pitting and soil boring activities, along with soil screening and sampling, showed extensive hydrocarbon contamination from ground surface to groundwater from the previously removed diesel aboveground storage tank. Samples of groundwater and surveys of free product showed free product on the beach and in some inland wells, as well as extensive dissolved phase hydrocarbon contamination throughout the Beach Seep Area.

### **Alternatives Considered for Drum Disposal Area and Beach Seep Area (BSA) Sediments, Free Product, and Groundwater**

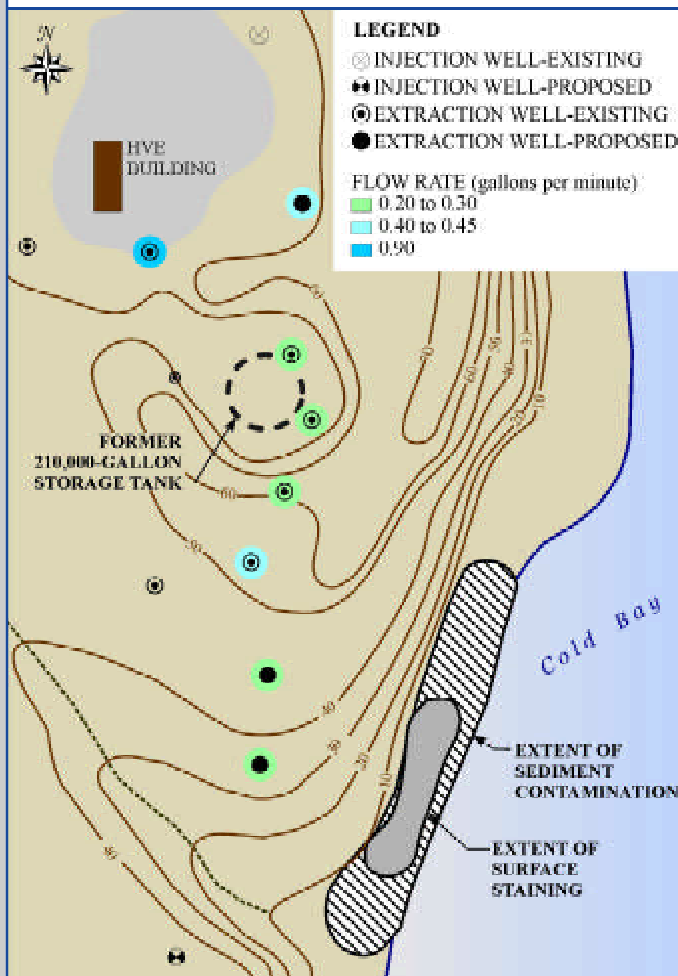
- Alternative 1 (BSA 1): No action.
- Alternative 3 (BSA 3): High vacuum extraction of free product and contaminated groundwater from an extraction well fence. Under this alternative, existing wells would be combined with a series of new wells to form a line of extraction wells along the east side of the site. These wells would serve as a downgradient cutoff fence to prevent free phase contamination from migrating toward Cold Bay. To implement this alternative, approximately 13 new extraction wells would be installed. The extracted groundwater and product would be treated by the existing high vacuum extraction system. The treated water would then be discharged to the existing injection well.
- Alternative 5 (BSA 5): High vacuum extraction for mass capture. Under this alternative, the existing high vacuum extraction system would be modified to maximize mass capture of free product and groundwater contamination (see Figure 7). The modification would be designed to remove as much product from the groundwater as quickly as possible. The proposed modification would include approximately three additional extraction wells. A second injection well would be required to discharge treated water and to improve hydraulic control. In addition, the HVE controls system would be upgraded and the operational strategy would be modified. A telemetry system would be added that would allow the remote control of selected instrumentation, pumps, and valves. This would allow early detection and resolution of potential problems and help minimize system downtime.

*Downgradient: in the direction that groundwater is flowing.*

TABLE 7: COMPARISON OF ALTERNATIVES FOR DRUM DISPOSAL AREA AND BEACH SEEP AREA SEDIMENTS, FREE PRODUCT, AND GROUNDWATER

Evaluation Criteria	BSA 1	BSA 3	BSA 5
Overall Protection of Human Health and the Environment	○	●	●
Compliance with applicable or relevant and appropriate requirements	○	●	●
Long-Term Effectiveness and Permanence	○	◐	●
Reduction in Toxicity, Mobility, and Volume Through Treatment	○	●	●
Short-Term Effectiveness	○	●	◐
Implementability	◐	●	●
Cost (in millions)	\$0	\$6.4	\$6.2
● = meets or exceeds criteria    ◐ = partially meets criteria    ○ = does not meet criteria			

FIGURE 7: BSA-5 WELLS FOR THE HVE SYSTEM



### Preferred Alternative for Drum Disposal Area and Beach Seep Area Sediments, Free Product, and Groundwater

Alternative 5 is the preferred alternative for sediments, free product and groundwater at the Drum Disposal Area and Beach Seep Area. The no-action alternative would not protect human health and the environment and was eliminated. Both Alternatives 3 and 5 could be implemented relatively easily because they rely heavily on the existing, operational HVE system. The primary difference between Alternatives 3 and 5 is their pumping scenarios. Alternative 3 is expected to restore Beach Seep Area sediments more rapidly than Alternative 5 but would require more time than Alternative 5 to remove free product and restore groundwater. Additionally, Alternative 3 is estimated to cost about \$230,000 more than Alternative 5. Of the two alternatives, Alternative 5 appears to offer better long-term effectiveness and permanence. Based on its ability to clean up all site contamination more rapidly and its lower cost, Alternative 5 is preferred for the site. Under the preferred alternative, operation of the modified HVE treatment system would continue as long as removal of free product remains technically feasible and cost effective. Following treatment, monitored natural attenuation would be conducted until cleanup goals are met.